7.0 O&M of Monitoring Locations

7.1 Automated Surface Water Monitoring Stations

Typical equipment for each automated surface water monitoring station includes a primary flow-control structure (e.g., Parshall flume), an ISCO® flow meter controlling an ISCO® automated sampler, a power system, and a telemetry unit (Figure 7–1). Instrumentation is installed in a secure, weather-resistant housing at all locations. Detailed information regarding installation, programming, and operation of the various equipment can be found in the resources listed in Section 7.1.3 below.

1. Primary Flow-Control Structure: Each station employs a flow-control structure to measure stream flow; flumes or weirs are installed in natural stream channels and ditches, or fastened to existing concrete or metal stormwater conveyance structures. RFS currently uses v-notch weirs, Parshall flumes, and H-flumes (includes H-, HL-, and HS-). Each structure is equipped with a staff gage for visual water level measurements (generally enameled steel with 0.01-foot graduations). The specific structures are listed in the tables in Section 6.0. Detailed specifications for each structure are recorded in a field logbook during installation for subsequent input to as-built electronic files. Installations must be adequately documented to ensure flow-control structures meet specifications and provide quality flow records. Written notes documenting the specifications for each flow-control structure, including dimensions, relative elevations, and photographs showing the completed monitoring station, are required to document that the monitoring station record is technically defensible

   Discharge ratings (water level to flow conversions) are generated for each flow-control structure based on type and relative elevations. These ratings are used to convert water level data to flow data during data evaluation (see Section 8.2.1).

   Locations are surveyed using a global positioning system or screen-digitized using Geographic Information Systems (GIS).

2. Flow Meter: Each station uses a flow meter to measure and log water level data. RFS currently uses ISCO bubbler and submerged-probe type meters. The flow meters are programmed to log water levels at 5-minute intervals to internal memory. The content of the internal memory is downloaded at least monthly to a field laptop using the proprietary ISCO Flowlink software (essentially an Access database) for subsequent evaluation (see Section 8.2.1).

   The flow meter is also programmed to output a 4-20mA signal proportional to measured water level where 4mA=0 feet and 20mA=[full scale]. The full scale varies by location and structure. The 4-20mA signal provides input to the telemetry system.

   The flow meter is also programmed with the appropriate flow conversion based on the type and specifications of the station structure. The flow meter continuously converts the measured water levels to flow rates. The flow meter is also programmed to control the automated sampler by sending a voltage pulse (flow pulse) to the sampler after each volume interval (e.g., one pulse per 100 cubic feet of streamflow volume).

3. Automated Sampler: Each station where sampling is conducted equipped with an ISCO 3700 Series automated composite sampler. The sampler is programmed to collect flow-paced composites based on the volume of streamflow measured by the flow meter. The sampler deposits an aliquot (or grab) in the composite bottle (a 22-L or 15-L carboy) based on the accumulate flow pulses from the flow meter (e.g., one aliquot per 1,000 cubic feet of streamflow volume). Each sampler is also equipped with a liquid detector to determine when a successful aliquot is collected. Upon successful collection of an aliquot, the sampler sends a voltage pulse (event pulse) back to the flow meter for logging (these event marks are downloaded as for water level data). See Section 8.1.1 for instructions regarding flow-paced sampling.

   The sampler is programmed to perform one intake line rinse before each grab. The sampler is also programmed to retry (once) an individual grab if the initial attempt fails (a ‘miss’).

   Water is drawn to the sampler by an integrated peristaltic pump connected to a 3/8-inch vinyl sample tube with an intake strainer at the water source near the flow structure. Sampler intakes are positioned such that representative samples are collected at each station. Intakes are positioned to collect only water that flowed through the flow-control structure. The intakes must be secured high enough off the streambed so as not to collect nonrepresentative sediment quantities, but low enough to be submerged during near-zero flow rates.

4. Select locations are also equipped with dedicated tipping bucket precipitation gages. Precipitation gages are installed such that nearby structures do not interfere with precipitation collection. Each tip (transmitted as a contact closure) represents 0.01 inch of precipitation. The flow meter also logs the precipitation data at 5-minute intervals. Three additional precipitation gages are installed at telemetry nodes for real-time data transmission. It should be noted that none of the precipitation gages are heated due to the lack of AC line power, as such, water equivalent for snow events may be underestimated or delayed until natural melting occurs.

5. Each location is also connected to dedicated telemetry hardware for real-time data collection (see Section 7.1.2 for detail).

6. Power for the instrumentation is provided by 12VDC solar power systems.

Prior to initiating intrusive work, all intrusive activities that extend to a depth of more than 18 inches will be evaluated for the potential of intercepting contaminated soils. This is in keeping with the land use restrictions as further detailed in the soil disturbance requirements of Section 9.3 and Appendix F.

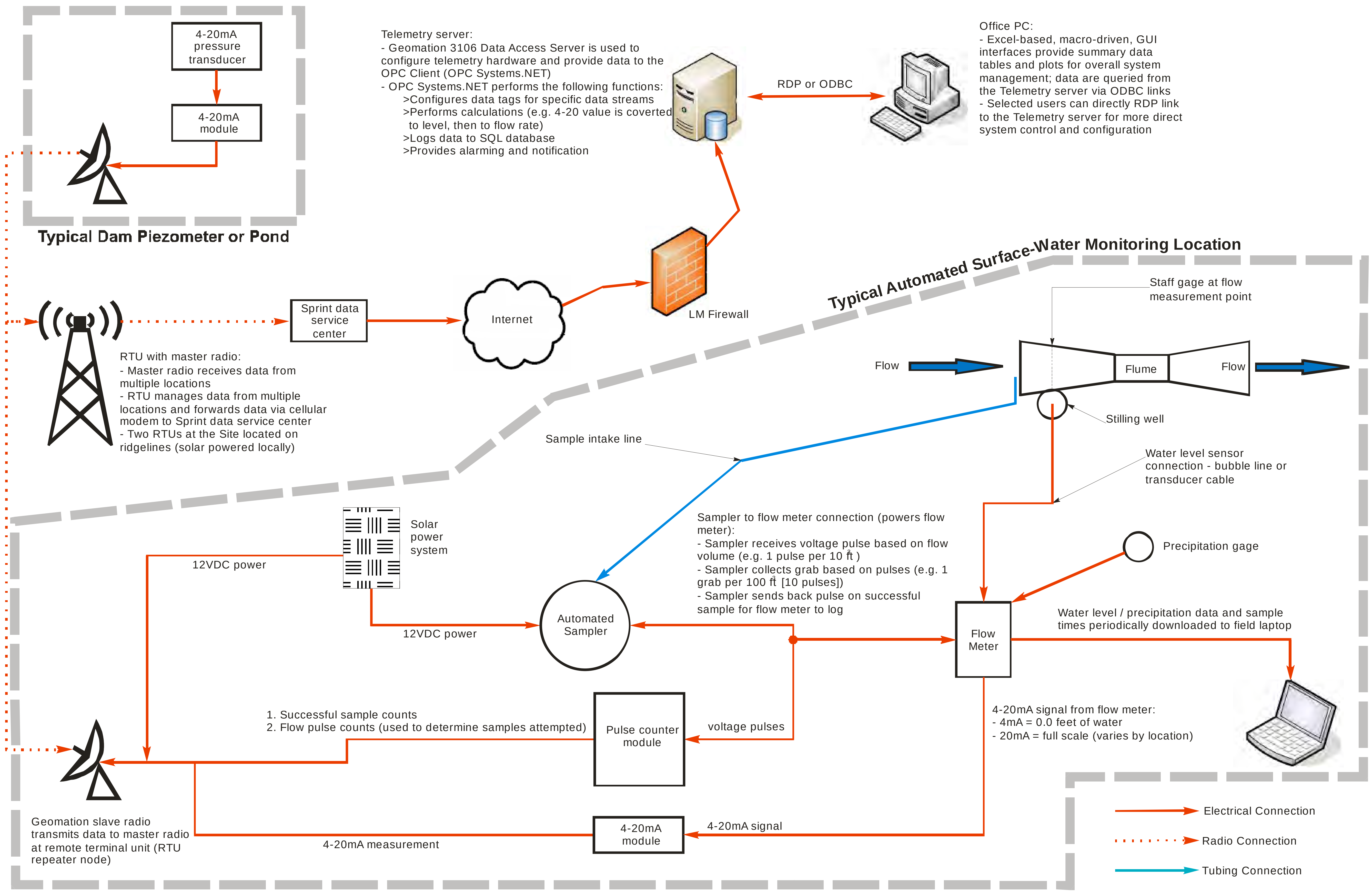

Figure 7–1. Generalized Schematic of the Rocky Flats Automated Monitoring Network.

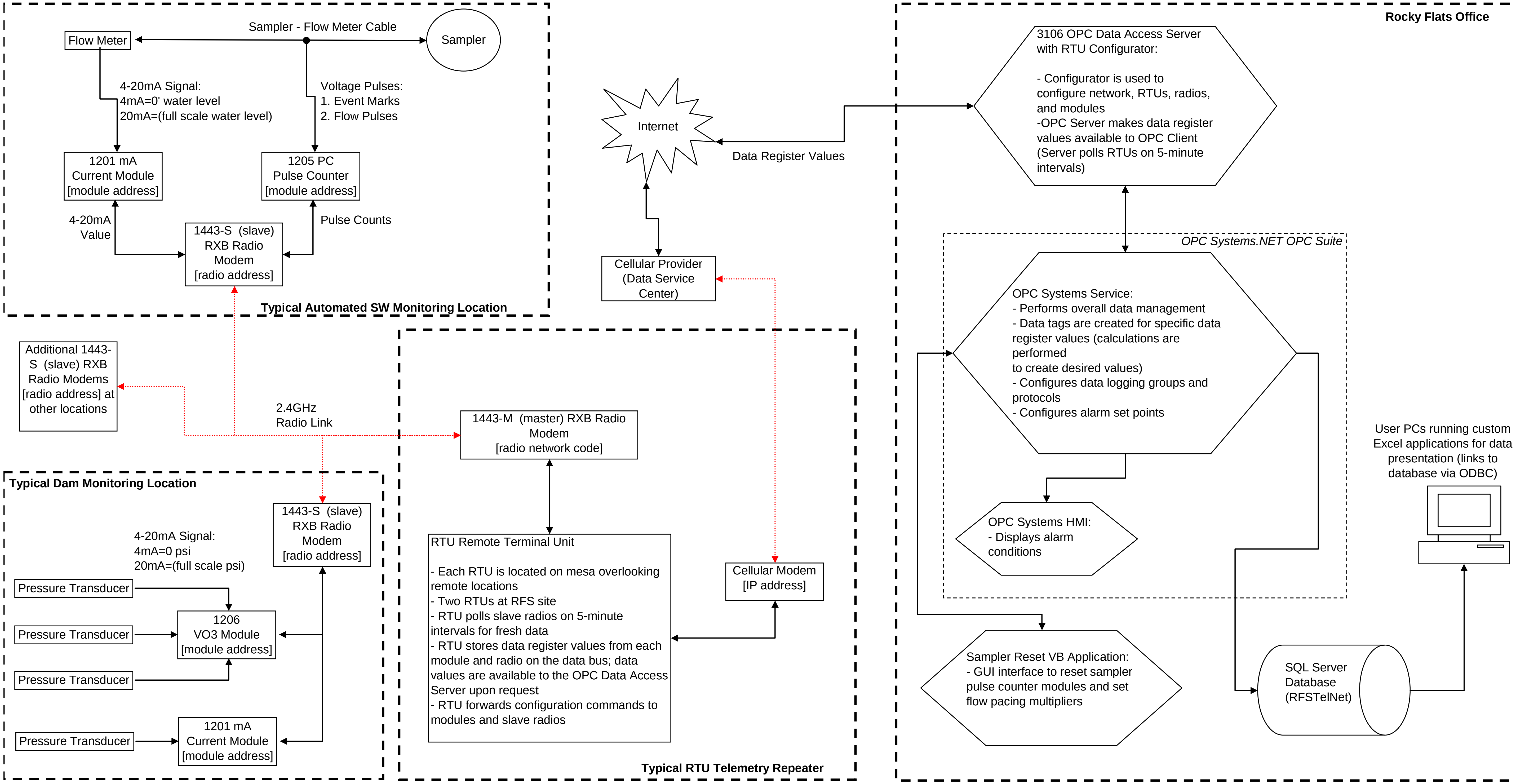

Figure 7–2. Detailed Rocky Flats Telemetry Schematic

7.1.1 Station Operation and Maintenance

Periodic instrument programming information, field observations, repair/modification records, and calibration records are recorded in a field logbook.[9] This information may be subsequently used to aid in the computation of the discharge records for each station (see Section 8.2.1).

Qualitative checks of structure integrity are conducted during every field visit, which occur at least semimonthly. Each field visit should include the following actions in the order listed (items showing record are required logbook entries):[10]

1. Water Level Measurement (Initial)
   a. Record Date Time, meter level reading, and water level on staff gage.
      i. Read meter to nearest 0.001 foot, staff to nearest 0.005 foot.
      ii. Fluctuating meter readings should be averaged (large fluctuations are indication of turbulence, debris/ice in flume, sediment in well, clogged bubble line, and/or malfunctioning meter); record condition in log.
      iii. If meter is within 0.005 foot of staff gage level, then record staff level as exact.
      iv. If staff cannot be accurately read due to debris/ice and/or turbulence, record that staff level could not be read.

2. General Maintenance
   a. Check entire site for evidence of conditions that may affect data collection, such as damage due to weather, animal activity, vandalism, etc. (record in log).
   b. Correct/repair as necessary (record in log).
   c. Download meter data; downloads should be performed monthly at a minimum and always during sample collection or sample restart (see below; record in log).
   d. Check/adjust meter and sampler clocks at least monthly (record in log).
   e. All precipitation gages should be checked at least monthly.
      i. Check level (each gage includes an integrated bubble level) and instrument condition; correct as necessary.
      ii. Remove any debris in funnel.
      iii. Record DateTime for any maintenance and accidental tips.

3. Flow Measurement
   a. Confirm proper operation of primary device (i.e. flume, weir).
      i. Debris/ice
         1. Note any ice or debris in device (record in log).
         2. Remove debris/ice as appropriate; care should be taken not to damage device; in some cases ice may not be removable (record in log).
         3. Note any backwater affecting device (record in log).
         4. If backwater is present, remove downstream debris/ice or improve flow in downstream channel (light digging) to eliminate backwater (record in log).

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[9] The telemetry system is also used to detect equipment malfunctions prior to an actual field visit. Receipt of anomalous data may initiate a field visit.

[10] To aid in flow data compilation, it is important that staff gage/flow meter water level reading be made both **before** and **after** any maintenance that affects water levels in the structure (e.g., debris removal).

        5. Note any debris/ice observed in stilling well, confirm well intake is clear (record in log).
        6. If well/intake debris/ice is present, remove as appropriate; care should be taken not to damage device, bubble line, and/or transducer; in some cases ice may not be removable (record in log).
    ii. Structural integrity
        1. Inspect device for leaks, damage, out-of-level condition (bubble level should be used; record in log).
        2. Attempt to immediately repair/adjust, as appropriate (record in log).
        3. If repair cannot be made, note needed equipment and supplies for later repair (record in log).

b. Confirm proper flow meter operation.
    i. Inspect bubble line/transducer cable for damage, kinks, deterioration; (record in log).
    ii. Inspect bubble rate; should be 1/sec., adjust as necessary (record in log).
    iii. Confirm bubble line or transducer is securely fastened at appropriate measurement point for primary device; correct as appropriate (record in log if not secure).
    iv. Inspect bubble characteristics: double bubble, exceptionally large bubble, and frequent meter calibrations (across visits) are indication of sediment in well and/or clogged bubble line; correct as follows (record in log).
        1. Remove bubble line from well.
        2. Remove sediment as necessary (record in log).
        3. Clean bubble line with wire or pipe cleaner, then perform meter manual purge (record in log).
        4. Reinstall bubble line in well at level below point of zero flow (pzf), then perform manual purge.
    v. Inspect data on paper chart; flat line (nonfunctioning meter pressure sensor), very jagged line (ice; sediment in well), and line at unexpectedly high level (ice/debris) are indication of malfunction; troubleshoot as necessary (record in log).
    vi. Inspect chart paper and replace as necessary.
    vii. Inspect desiccant and replace as necessary.
    viii. Note any error messages on meter (e.g., power fail); troubleshoot/repair as necessary (record in log).
    ix. Heavy ice may require temporary removal of bubble line at meter; consult with surface water lead (record in log).

c. Crest Stage Indicator (CSI)[11]
    i. Determine if recent flows have exceeded normal capacity of primary device through telemetry data and/or paper chart review.
    ii. If capacity has been exceeded, measure flood level (distance from bottom of CSI rod to cork mark) (record in log).
    iii. Hand-remove cork from rod back into CSI casing; add cork to casing as needed.
    iv. Reinstall rod in casing.

[11] CSIs are installed at selected locations.

4. Water Level Measurement (Post-Maintenance/Repair); allow for water levels to equilibrate
    a. Record Date Time, meter level reading, water level on staff gage.
        i. Read meter to nearest 0.001 foot, staff to nearest 0.005 foot.
        ii. Fluctuating meter readings should be averaged (large fluctuations are indication of turbulence, debris/ice in flume, sediment in well, clogged bubble line, and/or malfunctioning meter); record condition in log.
        iii. If meter is within 0.005 foot of staff gage level, then record staff level as exact.
        iv. If staff cannot be accurately read due to debris/ice and/or turbulence, record that staff level could not be read.
    b. If meter level is *not* within 0.005 foot of staff level, calibrate meter.
        i. If stream water levels are fluctuating significantly, calibration should not be performed (record in log).
        ii. If small fluctuations are occurring, enter calibration level in meter when display shows average level.
        iii. Record the note **(cal)** after staff gage level if calibration is performed.

5. Sample Collection
    a. Collecting flow-paced composite
        i. Download flow meter to obtain event marks (record in log).
        ii. Record carboy identifier (e.g., carboy A).
        iii. Record total number of grabs (e.g., **done 45 of 110**).
        iv. Record flow pace for composite (in cubic feet).
        v. Record DateTime of first grab from sampler display; note if current sampling period is a restart.
            1. If first grab is missed, consult surface water lead for DateTime to use for composite on chain of custody (COC).
            2. Check DateTime of first from sampler display against downloaded event marks.
            3. DateTime from downloaded event marks is sample DateTime for COC.
            4. If composite is restart (see below), DateTime for COC is first after last composite collection (from downloaded event marks).
        vi. Record misses from sampler display[12].
            1. POCs/POEs: record all DateTimes for missed grabs.
            2. Other stations: record total number of misses and first/last DateTime for period of misses.
        vii. Record number of positive grabs (i.e., total grabs – misses).
        viii. Crosscheck positive grabs against downloaded event marks; record if correct counts in download.
            1. If crosscheck fails, attempt to reconcile: double grabs in download are generally misses or retries, record any sample grabs that are not in downloaded event marks, use previous log entries to check restart counts.
            2. Numerous event marks that are not on sampler suggest power problem with meter/sampler and/or telemetry (record in log).

[12] When the sampler attempts a grab and the liquid detector fails to sense liquid, a miss is recorded in the sampler memory. Misses can be caused by ice, equipment failures, power failures, etc. Sample misses are often indicated by telemetry and are addressed as soon as possible following notification.

b. Restarting a flow-paced composite[13]
   i. Perform steps (i) through (viii) above.
   ii. Determine capacity for additional grabs (110-positive grabs [22-L carboy] or 75-positive grabs [15-L carboy]).
   iii. Program sampler for additional grabs (record in log).
   iv. Record flow pace (cubic feet; use same as previous sampling period).
   v. Start new sampling period; record approximate Time of first grab (note if missed due to no flow or frozen sample line).

c. Starting a new flow-paced composite
   i. Program sampler for maximum grabs (110 or 75 as above; record in log).
   ii. Program sampler for desired flow pace (cubic feet; record in log; see Section 8.1.1 for determining flow pace).
   iii. Start new sampling run; record approximate Time of first (note if missed due to no flow or frozen sample line).

d. Sampler maintenance
   i. Replace pump tubing as prompted by sampler; reset tubing life at tubing change (set to 1E6 counts).
   ii. Confirm integrity of intake tubing; check for damage, kinks, deterioration, slope (for free draining); correct as necessary (record in log).
   iii. Confirm intake strainer is secure and free of debris/sediment, kinks, deterioration.
      1. Resecure as necessary.
      2. Remove sediment from around strainer as necessary.

The relative elevations of the flow-control structures are surveyed annually to ensure proper operation and provide input data for the generation of discharge ratings.

The following sections provide additional O&M detail:

- Section 8.1.1 “Automated Surface Water Sample Collection”; and
- Section 8.1.2 “Surface Water Field Data Collection.”

7.1.2 Telemetry System

The Site telemetry system centrally monitors the status of the automated monitoring locations. Telemetry is a valuable tool for the efficient operation of extensive automated monitoring networks, significantly reducing the number of time-consuming field visits. The system is fully flexible to allow for changing management needs. The data transmission needs are determined by the surface water lead who is responsible for the O&M of the monitoring network. The telemetry system also serves as a secondary data-collection platform in addition to management decision support.[14] The generalized system layout is presented in the Figure 7–1 and Figure 7–2 schematics.

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[13] A composite restart may be needed (at the direction of the surface water lead) when insufficient water has been collected due to misses, but the sampler is approaching the end of the programmed limit (e.g., 110 [200 mL] grabs for a 22-L carboy).

[14] Primary data collection of most data is performed by field-downloading the data directly from the instrumentation. The telemetry also serves as a redundant data collection system should field instrumentation memory malfunction.

The Geomation® telemetry operates with the Model 3106 OPC Data Access Server with a remote terminal unit (RTU) configurator. This software is used to program the instrumentation and interface with data logging and evaluation software. The Geomation Model 3106 is OPC-compliant, providing an industry-standard interface for the entire OutDAQ product line. OPC (OLE—Microsoft's Object Linking & Embedding—for Process Control) is a set of industry standards providing interoperability between field equipment, such as RTUs, with automation software for logging, archiving, and displaying data. The 3106 OPC Data Access Server provides a Modbus serial interface to 3300/3310 RTU networks, and provides a uniform data access interface to leading client software packages for Supervisory Control and Data Acquisition/Human Machine Interface (SCADA/HMI), data acquisition, trending, and archiving. For the OPC Client, the Site currently uses the OPC Systems.NET software package for tagging and logging of data. The Site has developed several Visual Basic applications and Open Database Connectivity (ODBC)-linked Excel spreadsheets for routine data evaluation and reporting.

Telemetry provides real-time information routinely used to manage systems such as the Site retention ponds. The following data streams are currently collected:

- Automated Sampler Status
  - Sampler Event Marks: The automated samplers are equipped with liquid detectors to determine when successful aliquot has been collected and deposited in the composite bottle (carboy). The event mark consists of a voltage pulse from the sampler to the flow meter. The telemetry "counts" these pulses as an indication of the completion status of a composite sample. The event mark totals are logged at 15-minute intervals.
  - Flow Meter Flow Pulses: The flow meters send a flow pulse to the samplers each time a predetermined streamflow volume is measured (e.g., every 10 cubic feet of flow volume). The telemetry system logs the accumulated flow pulses at 15-minute intervals. The accumulated flow pulses are then divided by the sample pacing to determine the targeted number of aliquots that should have been attempted based on flow volume. For example, if a sampler is programmed to collect an aliquot every 1, 000 cubic feet of streamflow volume (the "flow pace"), and the meter is programmed to send a flow pulse every 10 cubic feet of streamflow volume, then an aliquot is attempted every 100 pulses (1000/10=100).
  - Actual event marks are then compared to targeted samples based on flow pulse counts. When the two values diverge, this condition indicates sampler malfunction and a field visit is initiated. Notification alarms are established to alert personnel.
  - Pulse counts are reset to zero when a composite sample is collected from the field (and a new composite is started) using a custom VB application that can reset registers in the pulse counter modules. Similarly, the application is used to "write" flow pace values to the telemetry system that are used in the actual versus target sample comparison.
  - ODBC linked spreadsheets display tabular sampler status as well as sampling progress superimposed on the corresponding hydrograph.
- Power Status: Battery voltage measurements are logged hourly. Notification alarms are established to alert personnel of low power supply.

- Flow Rates:
  - The flow meters output 4-20mA signals in proportion to the measured water levels. Notification alarms are established to alert personnel of faulty 4-20mA readings.
  - These 4-20mA values are converted by the telemetry to the corresponding water level based on the specific programming at each flow meter. The water levels are logged at 15-minute intervals.
  - The telemetry then converts the water level values to corresponding flow rates based on the discharge ratings at each location. These flow rates are also logged at 15-minute intervals.
  - ODBC linked spreadsheets display tabular flow rates as well as the corresponding hydrograph.
- Piezometer Water Levels
  - Pressure transducers in select dam piezometers output 4-20mA signals in proportion to the measured water levels. Notification alarms are established to alert personnel of faulty 4-20mA readings.
  - These 4-20mA values are converted by the telemetry to the corresponding water level based on the specific characteristics of each piezometer and transducer. The water levels are logged hourly.
  - Notification alarms are established to alert personnel of water levels exceeding warning levels that may indicate structural problems with the dam.
  - ODBC linked spreadsheets display tabular piezometer levels as well as temporal plots.
- Pond Water Levels
  - Pressure transducers in select dam pools output 4-20mA signals in proportion to the measured water levels. Notification alarms are established to alert personnel of faulty 4-20mA readings.
  - These 4-20mA values are converted by the telemetry to the corresponding water level based on the specific characteristics of each transducer. The water levels are logged hourly.
  - ODBC linked spreadsheets display tabular pond levels as well as temporal plots.
  - The water levels are converted to volumes and surface areas in ODBC linked spreadsheets to produce periodic Water Lease Reports and aid in pond water management.
- Precipitation
  - Tipping bucket rain gages are installed at three telemetry locations. Each tip forms a contact closure that is “counted” by the telemetry. Each tip represents 0.01 inch of precipitation. These counts are summarized in ODBC linked spreadsheets to show daily hyetographs, daily totals, and monthly totals.

7.1.3 Applicable Instructions and Resources

All flow-control structures, precipitation gages, ISCO® instrumentation, telemetry equipment, and power supplies will be installed, programmed, and performance-checked per the manufacturer's instructions.

The applicable manufacturer manuals are as follows:

- Open Automation Software. *Online Users Guide for OPC Systems.NET*, Evergreen, Colorado.
- Geomation Measurement and Control Systems, Inc., 2004. *Operation and Maintenance: 3300 & 3310 Remote Terminal Units (RTUs), OutDAQ Options & Accessories*, Geomation, Inc., Colorado.
- ISCO, Inc., 2004. *FLOWLINK4 for Windows*, ISCO, Inc., Nebraska, July.
- ISCO, Inc., 2006a. *4230 Flow Meter, Installation and Operation Guide*, Rev. X, ISCO, Inc., Nebraska, May.
- ISCO, Inc., 2006b. *4220 Submerged Probe Flow Meter, Installation and Operation Guide*, Rev. U, ISCO, Inc., Nebraska, May.
- ISCO, Inc., 2006c. *3700 Portable Samplers Installation and Operation Guide*, Rev. CC, ISCO, Inc., Nebraska, May.
- ISCO, Inc., 2006d. *3710 Portable Samplers Installation and Operation Guide*, Rev. V, ISCO, Inc., Nebraska, May.

7.2 Groundwater Monitoring Wells

Monitoring wells, piezometers, well points, and other such groundwater monitoring devices (collectively referred to herein as "wells") have been installed at Rocky Flats since 1954 or earlier, with over 1,460 wells installed since the 1950s. Periodically over the years, obsolete, unnecessary, and damaged wells have been abandoned. This section describes maintenance, abandonment, replacement, and installation of wells. Some of these activities may require notification or permitting with the State Engineer's office; refer to the Colorado Division of Water Resources website for current requirements. Note that monitoring wells at CERCLA and RCRA sites are exempt from permit requirements (State of Colorado 2006), but documentation of well installation and abandonment is required, and will be maintained in accordance with Section 12.0. However, previous practice at the Site has been otherwise, and for wells installed, replaced, or abandoned through the end of 2005 the Site obtained well permits and provided the associated forms, as well as Construction and Abandonment reports, as applicable.

7.2.1 Well Maintenance

Monitoring wells will be routinely maintained. Wells will be redeveloped as necessary to remove sediment accumulation and decrease turbidity of samples. Instructions for well maintenance and development are provided in the SAP. Well components, including surface protection (well pad, protective casing, locking cap, and any other surficial components), well cap, annulus between well stickup and protective casing, and the belowground portions of the well, will be inspected as feasible during each visit. Surface protection will be maintained to guard against climate-related deterioration and otherwise ensure continued protection of the well within. The well cap will be removed and replaced carefully; if damaged, a new well cap will be installed as soon as practicable.

Some of the wells at the Site are installed within soils that are settling and thus, over time, the well cap may protrude from the protective casing. This makes locking the casing difficult. When this occurs, the groundwater lead will be informed and the well casing will be trimmed as follows:

1. The amount of well casing to be removed will be measured.
2. Using appropriate tools to create a flat, horizontal cut, the casing will be cut. Personnel performing this activity will take care to keep the cut even and horizontal, and to minimize the amount of cuttings that enter the well bore.
3. A new measuring point (MP) will be cut or marked on the northern edge of the well casing. If a permanent marker is used, care will be taken to prevent markings on the inside of the well casing, given the high concentrations of VOCs in these markers. If the field crew feels it is appropriate, measures (such as allowing the well to vent for a few minutes) will be taken to allow VOCs that may have entered the well bore to dissipate. If a well is scheduled for sampling and during the same visit a permanent marker will be used to mark the MP, the MP will be marked after sample collection has concluded.
4. The amount of casing removed will be carefully measured, with the results conveyed to the groundwater and data management leads as soon as possible.

The groundwater and data management leads will ensure the necessary changes are made to SEEPro regarding the new top of casing elevation, with appropriate references to the date the cut was made so that data collected prior to the change are not affected but all subsequent data reference the appropriate casing elevation.

Well extensions will follow a similar, but reversed, procedure. The groundwater lead will be notified of any such need and will be involved in designing the extension and identifying the appropriate technique so as to minimize the potential for cross-contamination of or damage to the well.

The aboveground annulus will be kept free of biohazards such as wasp nests and spiders. If accumulated water is present within the annular space, it will be evacuated and, if approved by the groundwater lead, a vent hole will be drilled in the protective casing to allow water to drain freely from the annular space.

Observations of subsurface or other serious damage to a well (casing kinks, suspected screen breach, failure of the bottom cap, inability to completely remove sediment from a well, and so forth) will be immediately relayed to the groundwater lead; brief notes on sample collection forms or other field logs are not in and of themselves sufficient for this communication.

7.2.2 Well Abandonment

Wells determined to be damaged beyond repair or no longer necessary for groundwater monitoring purposes will be properly abandoned. This activity eliminates the well from the monitoring network in such a manner that the well will not remain a conduit for groundwater or contaminant migration. Wells are abandoned in accordance with the current Colorado Water Well Construction Rules (2 Code of Colorado Regulations [CCR] 402-2; State of Colorado 2005). Where needed for the network, wells that are damaged or not appropriately constructed for long-term monitoring will be replaced as discussed in Section 7.2.3. The groundwater lead will supervise the selection of wells for abandonment and the abandonment method.

Proper abandonment of wells is required under the following circumstances:

- When the potential for cross-contamination from the well exists;
- When the well is poorly constructed or damaged;
- When the well is in the way of proposed activities; and
- When the well has no identified purpose for future monitoring.

7.2.3 Well Replacement

Replacement wells will be installed if necessary and a unique identification code will be applied to the replacement well. The identification code will ensure data from other wells, both existing and historic, are not erroneously applied to the replacement well. The monitoring well identification code format in use at the Site was defined in the early 1990s and was in use through closure; it should continue to be followed for consistency. Under this method, each well is assigned a unique five-digit code. The last two digits of the well identification code represent the calendar year (CY) of installation (e.g., the identification of a well installed in CY 2009 should end in “09”), although this has not been rigorously followed in some cases. The first three digits are arbitrary; in the past, attempts have been made to select a code that contains some logical reference (e.g., well 88104 at former Building 881), although those references are often not intuitive in the post-closure era. Other well identification schemes were used in the decades of well installation at the RFP/RFETS, and several wells in the current network do not conform to this identification code format, as they were installed prior to establishment of the format. However, these well names do contain the year of installation as the last two digits. (Examples include several wells installed in the 1980s.)

Replacement wells will typically conform to the design of the original well, although this is not required. The groundwater lead will supervise the design and location of each well replacement, which will be installed in accordance with the current SAP and Water Well Construction Rules (2 CCR 402-2; State of Colorado 2005).

7.2.4 New Well Installation

New well installations will follow the nomenclature described above. These wells will be installed following development of an appropriate work-control document (e.g., a SAP or work plan) that specifies the objectives and specific requirements including well location and design. Geologic logging should be performed due to the heterogeneous nature of the UHSU (strongly affecting groundwater flow) and, in particular, the importance of the bedrock contact and the nature of the bedrock (lithology, fracturing, evidence of fluid flow, and so forth) to Site hydrology and groundwater monitoring. Similarly, if possible, geologic core rather than cuttings should be logged. Wells will be installed in accordance with the SAP and the current Water Well

Construction Rules (2 CCR 402-2; State of Colorado 2005). As with replacement wells, the groundwater lead will supervise the design and location of each new well.

7.2.5 Documentation

SEEPro will be updated appropriately following any change to a well's construction (such as extending or shortening the well casing). This database is the primary source of all monitoring location information and must be kept current. User-maintained databases or spreadsheets may also be useful, but are not the primary source of this information. In addition, each well abandonment, replacement, and installation will be added to this database, which includes such information as the well identification, location, design details, and summary geologic information. The data management lead will supervise updates to SEEPro.

Additional documentation required by the SAP will also be completed as appropriate.